

CLAIMS:

What is claimed is:

1           1.     A method of producing a pre-alloyed stabilized zirconia powder comprising the  
2 steps of:

3           alloying zirconia with a stabilizer selected from the group of yttria, ceria, magnesia,  
4 ytterbia, scandia, dysprosia, neodymia, and calcia, the stabilizer being present in a quantity of  
5 between about 5% and 25% relative to the zirconia by weight;

6           powderizing the alloyed stabilized zirconia;

7           spray-drying the stabilized zirconia powder to produce an agglomerated powder having  
8 an average particle size suitable for use in spray coating applications.

9           2.     The method of claim 1, wherein the stabilizer is yttria.

10          3.     The method of claim 2, wherein the yttria is present in a quantity of between  
11 about 6% and 10% relative to the zirconia.

12          4.     The method of claim 3, wherein the yttria is present in a quantity of about 8%  
13 relative to the zirconia.

14          5.     The method of claim 1, wherein at least a substantial portion of the stabilized  
15 zirconia powder comprises particles having a size of no more than about an order of magnitude  
16 smaller than an average particle size of the agglomerated powder.

1           6.     The method of claim 1, wherein the stabilized zirconia powder has an average  
2 particle size of no more than about 10 microns.

1           7.     The method of claim 6, wherein the agglomerated powder has an average particle  
2 size in the range of between about 11 and 150 microns.

1           8.     A pre-alloyed stabilized zirconia powder comprising generally spherical particles  
2 with an average size of between about 11 and 150 microns, each particle comprising a plurality  
3 of sub-particles held together by a binder, at least a portion of the sub-particles being alloyed  
4 with a stabilizer selected from the group of yttria, ceria, magnesia, ytterbia, scandia, dysprosia  
5 neodymia, and calcia, the stabilizer being present in a quantity of between about 5% and 25%  
6 relative to the zirconia by weight.

9.     The powder of claim 8, wherein the stabilizer is yttria.

1           10.    The powder of claim 9, wherein the yttria is present in a quantity of between  
2 about 6% and 10% relative to the zirconia.

1           11.    The powder of claim 10, wherein the yttria is present in a quantity of about 8%  
2 relative to the zirconia.

1           12.    The powder of claim 8, wherein at least a substantial portion of the sub-particles  
2    have a size of no more than about an order of magnitude smaller than an average particle size of  
3    the agglomerated powder.

1           13.    The powder of claim 8, wherein at least a substantial portion of the sub-particles  
2    are no more than about 10 microns in size.

1           14.    A method of producing a thermal barrier coating on a substrate comprising the  
2    steps of :  
3           providing a pre-alloyed stabilized zirconia powder comprising generally spherical  
4    particles with an average size of between about 11 and 150 microns, each particle comprising a  
5    plurality of sub-particles held together by a binder, at least a portion of the sub-particles being  
6    alloyed with a stabilizer selected from the group of yttria, ceria, magnesia, ytterbia, scandia,  
7    dysprosia neodymia, and calcia, the stabilizer being present in a quantity of between about 5%  
8    and 25% relative to the zirconia by weight; and  
9    applying the powder to the substrate using a thermal spray process.

1           15.    A thermal barrier coating produced according to the method of claim 14.

1           16.    The method of claim 14, wherein the stabilizer is yttria.

1           17.    The method of claim 16, wherein the yttria is present in a quantity of between  
2    about 6% and 10% relative to the zirconia.

1            18.    The method of claim 17, wherein the yttria is present in a quantity of about 8%  
2    relative to the zirconia.

1            19.     The method of claim 14, wherein at least a substantial portion of the sub-particles  
2     have a size of no more than about an order of magnitude smaller than an average particle size of  
3     the agglomerated powder.

20. The method of claim 14, wherein at least a substantial portion of the sub-particles are no more than about 10 microns in size.

21. A thermal barrier coating comprising:  
zirconia alloyed with a stabilizer selected from the group of yttria, ceria, magnesia, ytterbia, scandia, dysprosia, neodymia, and calcia, the stabilizer being present in a quantity of between about 5% and 25% relative to the zirconia by weight;  
the thermal barrier coating having a porosity of about 11% and a thermal conductivity less than or equal to about 0.49 W/m-K at temperatures of at least 25°C.

1            22.    The thermal barrier coating of claim 21, wherein the stabilizer is yttria.

1            23.     The thermal barrier coating of claim 22, wherein the yttria is present in a quantity  
2     of between about 6% and 10% relative to the zirconia.

1            24.    The thermal barrier coating of claim 23, wherein the yttria is present in a quantity  
2 of about 8% relative to the zirconia.

1            25.    A thermal barrier coating comprising:  
2            zirconia alloyed with yttria, the yttria being present in a quantity of about 8% relative to  
3 the zirconia by weight;  
4            the thermal barrier coating having a porosity of about 11% and a thermal conductivity  
5 less than or equal to about 0.47 W/m-K at temperatures of at least 25°C.

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          26.    The thermal barrier coating of claim 25, having a thermal conductivity of less  
than or equal to about 0.43 W/m-K at temperatures between 500 and 1000 °C.

          27.    The thermal barrier coating of claim 25, having a thermal conductivity of between  
about 0.47 W/m-K to about 0.375 W/m-K in a temperature range between 25 and 1000 °C.